

What is claimed is:

1. An apparatus for removing a resist film used in a lithographic process, said apparatus comprising:  
means for bringing steam into contact with said resist film; and

means for spraying steam onto said resist film,  
wherein said resist film is peeled off by an action of steam.

2. An apparatus as set forth in claim 1, wherein said resist film is peeled off with saturated or superheated steam at a temperature within the range of 70°C to 200°C.

3. An apparatus for removing a resist film used in a lithographic process, said apparatus comprising:  
means for spraying saturated steam onto said resist film,  
wherein said resist film is peeled off by an action of said saturated steam.

4. An apparatus as set forth in claim 3, wherein the temperature of said saturated steam at the target surface is within the range of 70°C to 100°C.

5. An apparatus as set forth in claim 1, wherein steam containing an ingredient for promoting a change

in quality of said resist film is brought into contact with and/or sprayed onto a surface of said resist film to peel said resist film.

6. An apparatus as set forth in claim 1, comprising a steam supply system including a subsystem for generating steam, a subsystem for heating steam, a subsystem for controlling the water quantity to be supplied and the heat amount for heating, and a subsystem for controlling the pressure of steam, said steam supply system being connected to an ultrapure water supply line for selectively supplying saturated or superheated steam at a temperature within the range of 70°C to 200°C.

7. An apparatus as set forth in claim 6, wherein said steam supply system further includes a subsystem for switching lines between said ultrapure water supply line and a line for a solution containing an ingredient for promoting a change in quality of said resist film, and an injecting pump for said ingredient, so that steam containing said ingredient and steam not containing said ingredient can be switched over.

8. An apparatus as set forth in claim 1, further comprising an ultraviolet reactor including an ultraviolet lamp of a wavelength corresponding to a transmissive distance of not less than 10 mm to steam,

said ultraviolet lamp being disposed in parallel with a substrate surface on which said resist film is formed, so that said substrate surface can be irradiated while and after said resist film is peeled off said substrate surface by the action of steam.

9. An apparatus as set forth in claim 1, further comprising a chamber provided with a system for taking in a substrate on which said resist film is formed and taking out said substrate off which said resist film has been peeled, a system for purging an atmosphere in said chamber, a system for discharging gas or liquid from said chamber, a system for introducing steam into said chamber, and a system for driving a steam spraying nozzle to move relatively to the substrate surface on which said resist film is formed, so as to sweep said substrate surface, said steam spraying nozzle spraying steam onto said substrate surface to peel said resist film off said substrate surface.

10. An apparatus as set forth in claim 9, wherein said chamber is further provided with a system for supplying carbonic acid gas from a gas bomb into said chamber, and a gas spraying nozzle for spraying carbonic acid gas onto said substrate surface rapidly to cool said resist film to be peeled off.

11. An apparatus as set forth in claim 7, further comprising a supply line for a liquid chemical for cleaning a substrate, connected to said steam supply system, wherein said substrate off which said resist film has been peeled is cleaned by irradiation with ultraviolet rays and spraying steam, and then dried by spraying superheated steam.

12. An apparatus as set forth in claim 1, further comprising a filter for filtering off pieces of said resist film having been peeled off a substrate and contained in a liquid being discharged, or a centrifugal separator for separating said pieces from said liquid, wherein said liquid from which said pieces have been removed is reused.

13. A method for removing a resist film used in a lithographic process, said method comprising steps of:

bringing saturated or superheated steam into contact with said resist film; and

spraying saturated or superheated steam onto said resist film,

wherein said resist film is peeled off by an action of steam.

14. A method as set forth in claim 13, wherein steam containing an ingredient for promoting a change

in quality of said resist film is brought into contact with a surface of said resist film to peel said resist film.

15. A method for removing a resist film used in a lithographic process, wherein saturated steam is sprayed onto said resist film, and said resist film is peeled off by an action of said saturated steam.

16. A method as set forth in claim 15, wherein the temperature of said saturated steam at the target surface is within the range of 70°C to 100°C.

17. A method as set forth in claim 13, wherein a substrate surface on which said resist film is formed, is irradiated with excimer ultraviolet rays of a wavelength corresponding to a transmissive distance of not less than 10 mm to steam, while and after said resist film is peeled off said substrate surface by the action of steam.

18. A method as set forth in claim 13, wherein organic, metallic, and granular contaminants are removed from a substrate surface off which said resist film has been peeled, by spraying steam with irradiating said substrate surface with ultraviolet rays, and then said substrate surface is cleaned and dried by spraying steam.

19. A method as set forth in claim 13, wherein steam containing an ingredient for promoting a change in quality of said resist film is brought into contact with and/or sprayed onto a surface of said resist film to peel said resist film.

20. An apparatus for removing a resist film used in a lithographic process, said apparatus comprising: means for making steam act on said resist film, wherein said resist film is peeled off by the action of said steam.

21. An apparatus as set forth in claim 20, wherein said steam is saturated steam, and the temperature of said saturated steam at the target surface is within the range of 70°C to 100°C. —

22. An apparatus as set forth in claim 20, wherein steam containing an ingredient for promoting a change in quality of said resist film is made to act on a surface of said resist film to be peeled off.

23. An apparatus as set forth in claim 20, further comprising at least one of:  
means for making water act on said resist film;  
means for making vapor of isopropyl alcohol act on said resist film;

means for making compressed carbonic acid gas act on said resist film;

means for adding a chemical ingredient into said steam and/or said water;

means for irradiating said resist film with ultraviolet rays;

means for applying high-frequency supersonic waves to said resist film; and

means for cooling a substrate on which said resist film is formed,

wherein said resist film is peeled off by properly combining at least one of time and/or spatial conditions, conditions on temperature, and physical and/or chemical conditions for operating each of said means.

24. A method for removing a resist film used in a lithographic process, said method comprising:

a step of making steam act on said resist film, wherein said resist film is peeled off by the action of said steam.

25. A method as set forth in claim 24, further comprising at least one of:

a step of making water act on said resist film; a step of making vapor of isopropyl alcohol act on said resist film;

a step of making compressed carbonic acid gas act on said resist film;

a step of adding a chemical ingredient into said steam and/or said water;

a step of irradiating said resist film with ultraviolet rays;

a step of applying high-frequency supersonic waves to said resist film; and

a step of cooling a substrate on which said resist film is formed,

wherein said resist film is peeled off by properly cross-combining at least one of time and/or spatial conditions, conditions on temperature, and physical and/or chemical conditions for performing each of said steps.